

## PATENT ABSTRACTS OF JAPAN

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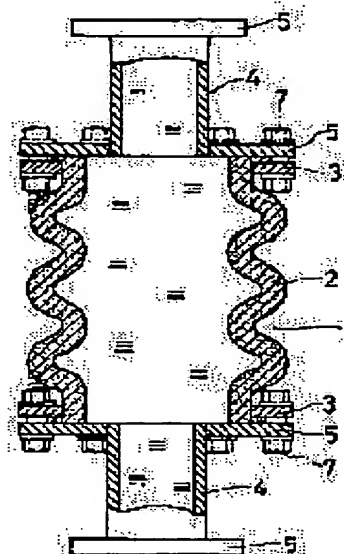
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## (54) SILENCING METHOD FOR WATER PIPING, AND SILENCER FOR WATER PIPING

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To reduce both transmission of vibration through a duct wall and sound through water in a duct, and reduce effectively transmission sound of solid into the room, by expanding the aperture of the duct of the pipe coupling which connects a flexible coupling which has the larger aperture than that of the piping to the water pipe connecting to a vibrator.

**SOLUTION:** A silencer for water piping consists of a flexible coupling 1, and in this flexible coupling 1, a connecting flange 3 is placed on both ends of a rubber coupling 2, and the aperture of the rubber coupling 2 is larger than that of a short pipe 4. In this case, during operating, when vibration which transmits through the short pipe 4 from a pump transmits through the wall of the rubber coupling 2, the vibration largely damps to reduce the transmitting volume to the another. When the sound which transmits from the pump to the water in the short pipe 4 reaches in the rubber coupling 2 from the inside of the short pipe 4, the aperture of the duct suddenly becomes large and the sound impedance changes largely to reduce the sound and the transmitting volume to the another end.



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CLAIMS

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[Claim(s)]

[Claim 1] The silence approach for water piping characterized by connecting the flexible pipe joint of bigger aperture than the aperture of that piping to water piping which stands in a row in vibration-generator vessels, such as a pump, and expanding the diameter of a duct in this pipe joint [claim 2] It is the silencer for water piping [claim 3] characterized by having connected the short pipe, having constituted on both sides of a flexible pipe joint, and constituting the aperture of a flexible pipe joint from aperture of a short pipe greatly. The silencer for water piping according to claim 2 characterized by forming the flange for connection or a screw thread with water piping in the edge of a short pipe [claim 4] A flexible pipe joint and a short pipe are a silencer for water piping according to claim 2 or 3 [claim 5] characterized by connecting by the flange connection. A flexible pipe joint and a short pipe are a silencer for water piping according to claim 2 or 3 [claim 6] characterized by connecting by the thread connection. A flexible pipe joint and a short pipe are a silencer for water piping according to claim 2 or 3 characterized by constituting in one.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the silence approach for water piping and the silencer for water piping which are applied in order to reduce that the oscillation and sound which are generated from devices for water supply, such as a pump, are spread and emitted to a sitting-room etc. through water piping in buildings, such as a hotel and an apartment.

[0002]

[Description of the Prior Art] for example, in buildings, such as a hotel and an apartment, when the oscillation and sound which are generated in feed water, hot water supply, or a coldness-and-warmth water pump spread to a building main part through water piping and emanate as a solid borne sound in a sitting-room from inner package material etc., being connected with the claim on sound is alike occasionally, and it is done. This solid borne sound appears notably in the range of 100-250Hz frequency in the frequency and general target which multiplied the number of sheets of the wing of a pump by the rotational frequency.

[0003] Although an oscillation of the duct wall of water piping spread from the pump etc. spreads and makes the solid borne sound of the pipeline system which affects such a sitting-room in a building main part from the main part penetration section of a duct, and the supporter of a duct an oscillation is transmitted to water piping through a duct wall from a pump etc. -- in addition, since sound is transmitted through the water in a duct, an oscillation of the duct wall of water piping in the above-mentioned main part penetration section or a supporter is influenced by the both sides of the oscillation transmitted through a duct wall, and the sound transmitted through a duct inner drainage. Therefore, in order to reduce the solid borne sound to a sitting-room, it is necessary to reduce the both sides of the oscillation transmitted through a tube wall, and the sound transmitted through a duct inner drainage.

[0004] As an approach for making it not transmit to water piping which the oscillation of a pump etc. connected conventionally, as shown, for example in drawing 4, the method of mainly installing the flexible pipe joint a made of rubber in a discharge-side [ of Pump b ] and intake side is common. This flexible pipe joint a is installing the thing of the diameter of said according to the aperture of the water piping c connected as shown in drawing 5. In this configuration, shaft orientations and the shear direction have a small spring constant, and there are some flexible pipe joints which have the good engine performance in the semantics of the insulation of an oscillation of a duct wall. Moreover, when you need the cure against reduction of a solid borne sound further, in order to reduce the pulsation transmitted to the water in water piping from a pump etc., the method of installing silencers, such as a resonance mold and an expansion mold, in the middle of water piping is also taken.

[0005]

[Problem(s) to be Solved by the Invention] as mentioned above, an oscillation is transmitted to water piping through a duct wall from a pump etc. -- in addition, with the conventional flexible pipe joint, since sound is transmitted through the water in a duct, even if it insulates an oscillation of a duct wall, sound will be penetrated through water, without seldom decreasing. Drawing 6 does not show the example which measured the reduction effectiveness (insertion loss) of the oscillation by the conventional flexible pipe joint, and an underwater sound, and only the about 10dB reduction

effectiveness is acquired for an oscillation and an underwater sound at the maximum in this example.

[0006] For this reason, even if it insulated the oscillation of a duct wall with the flexible pipe joint, a tube wall will be excited by the underwater sound pressure of the sound which penetrated the flexible pipe joint, an oscillation will be generated again, and this will cause the above-mentioned solid borne sound. For this reason, only with the conventional flexible pipe joint, it is difficult to perform sufficient reduction of a solid borne sound, and in order to be positive reduction of a solid borne sound, a silencer which was mentioned above will have to be installed separately and the number of components will increase. This invention aims at solving such a technical problem.

[0007]

[Means for Solving the Problem] In order to solve the technical problem mentioned above, in this invention, first, the flexible pipe joint of bigger aperture than the aperture of that piping is connected to water piping which stands in a row in vibration-generator vessels, such as a pump, and the silence approach for water piping which expands the diameter of a duct in this pipe joint is proposed.

[0008] Moreover, in this invention, on both sides of a flexible pipe joint, a short pipe is connected, it constitutes, and the aperture of a flexible pipe joint proposes the silencer for water piping greatly constituted from aperture of a short pipe.

[0009] Although it can consider as the configuration which prepares the flange for connection in the edge of a short pipe, and is connected with water piping in the silencer for water piping of the above-mentioned configuration in this invention, it can also consider as the configuration connected with water piping by the thread connection depending on the case.

[0010] On the other hand, in the silencer for water piping of the above-mentioned configuration, a flexible pipe joint and a short pipe are considered as the configuration connected by the flange connection or the thread connection, and also they can also constitute a flexible pipe joint and a short pipe from this invention in one.

[0011] According to the above this invention, while a flexible pipe joint can insulate the oscillation which lets a duct wall pass as usual, since the diameter of a duct is expanded in this part, a sound insertion loss becomes large and can reduce propagation of the sound exceeding a flexible pipe joint. In this way, the both sides of the sound which lets transfer and duct inner drainage of the oscillation through a duct wall pass only with a flexible pipe joint, i.e., an underwater sound, can be reduced.

[0012]

[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to drawing. Drawing 1 is the front view of the silencer for water piping which applied this invention, and drawing 2 is central drawing of longitudinal section. A sign 1 is a flexible pipe joint and this flexible pipe joint 1 is the configuration of having formed the flange 3 for connection in the ends of the body 2 of the joint made of rubber. Moreover, a sign 4 is the short pipe which formed the flange 5 for connection in ends, and has connected this short pipe 4 to the ends of the flexible pipe joint 1 by the flange connection of the flanges 3 and 5 for connection. Aperture of the body 2 of the joint made of rubber of the flexible pipe joint 1 is made larger than the aperture of a short pipe 4 as clearly shown in drawing 2. On the other hand, according to the aperture of deliveries, such as aperture of the water piping 6, and a pump, and inlet port, the diameter of said etc. can set up the aperture of a short pipe 4 suitably. In addition, the connection between the flexible pipe joint 1 and a short pipe 4 can be replaced with the above flange connection, and can apply a thread connection, and can also constitute it in one by welding etc. Moreover, the flexible pipe joint 1 can use a ready-made thing. A sign 7 is a bolt for connection.

[0013] In the above configuration, the silencer for water piping of this invention is installed in a discharge-side [ of a pump ], and intake side like the conventional flexible pipe joint made of rubber shown in drawing 4.

[0014] In this configuration, in case the oscillation transmitted from the pump to the end side of the flexible pipe joint 1 through the short pipe 4 is spread through the wall of the body 2 of the joint made of rubber, it decreases greatly and the amount of propagation by the side of the other end is reduced. Moreover, if the sound transmitted from the pump to the water in a short pipe 4, for example, the sound resulting from motion of the wing of a pump, results out of a short pipe 4 in the body 2 of the joint made of rubber by the side of the end of the flexible pipe joint 1, since the path of

a duct becomes large suddenly and an acoustic impedance changes a lot, sound attenuation will arise, and the amount of propagation by the side of the other end will be reduced.

[0015] It turns out that the reduction effectiveness 20dB or more is acquired, and the underwater sound transmitted in the oscillation and duct inner drainage which are transmitted in a duct wall in the 100-250Hz frequency range connected with the claim on sound shows sufficient reduction engine performance to both sides in this example of measurement by drawing 3 showing the result of having followed the silencer according the same measurement as drawing 6 to this invention.

[0016]

[Effect of the Invention] Since the silence approach of this invention and a silencer are as above, there is the following effectiveness.

- a. In a flexible pipe joint, transfer of the oscillation through a duct wall and the both sides of the sound which lets a duct inner drainage pass can be reduced, and the solid borne sound into a sitting-room can be reduced effectively.
- b. Since it is not necessary to install two or more elements, it is advantageous tooth-space-wise and in cost.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the front view of the silencer for water piping which applied this invention.

[Drawing 2] It is drawing of longitudinal section of the center of drawing 1 .

[Drawing 3] It is the explanatory view showing the example of measurement which shows the reduction effectiveness of the oscillation by the silencer for water piping which applied this invention, and an underwater sound.

[Drawing 4] It is the explanatory view showing the conventional approach for preventing transfer of the oscillation generated on a pump.

[Drawing 5] It is the explanatory view showing the main elements for preventing transfer of the oscillation generated on a pump.

[Drawing 6] It is the explanatory view showing the example of measurement which shows the reduction effectiveness of the oscillation by the element of drawing 6 , and an underwater sound.

[Description of Notations]

- 1 Flexible Pipe Joint
- 2 Body of Joint made of Rubber
- 3 Flange for Connection
- 4 Short Pipe
- 5 Flange
- 6 Water Piping
- 7 Bolt for Connection

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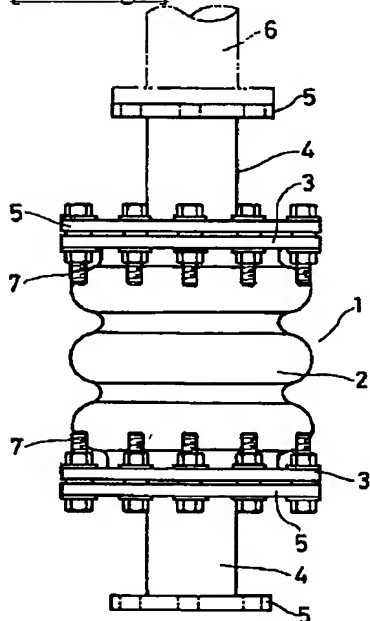
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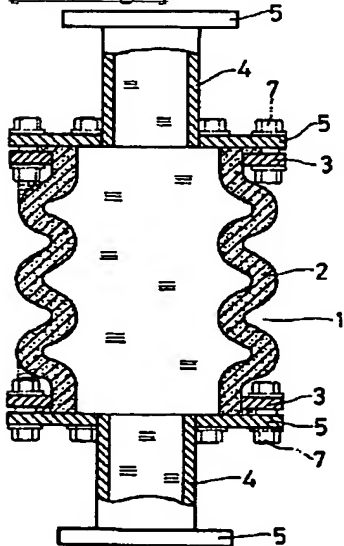
DRAWINGS

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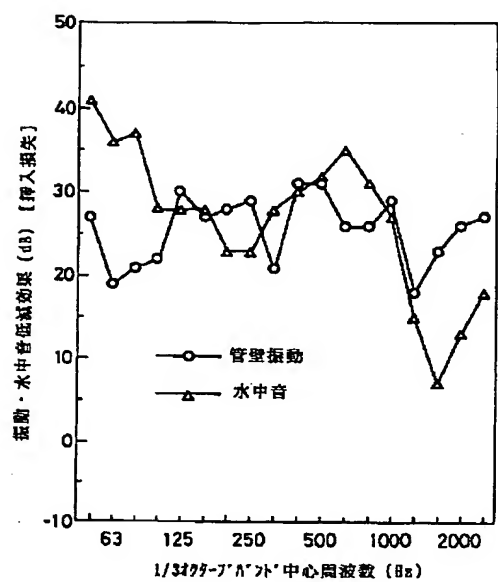
[Drawing 1]



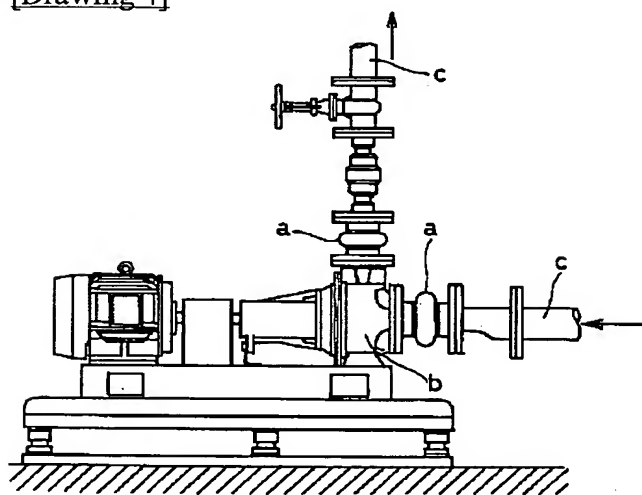
[Drawing 2]



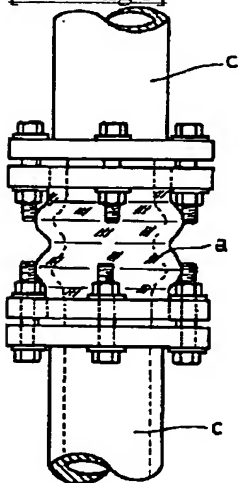
[Drawing 3]



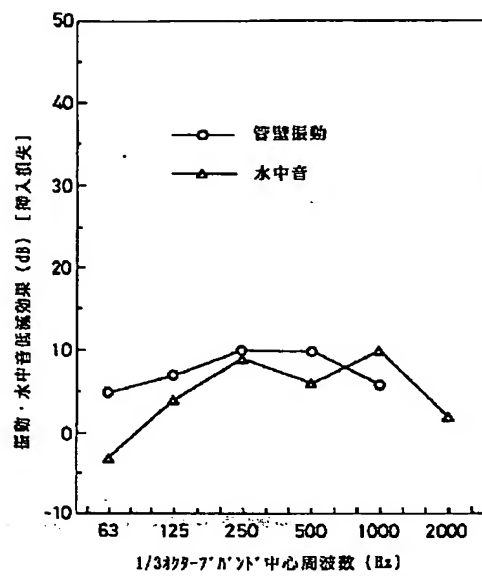
[Drawing 4]



[Drawing 5]



[Drawing 6]



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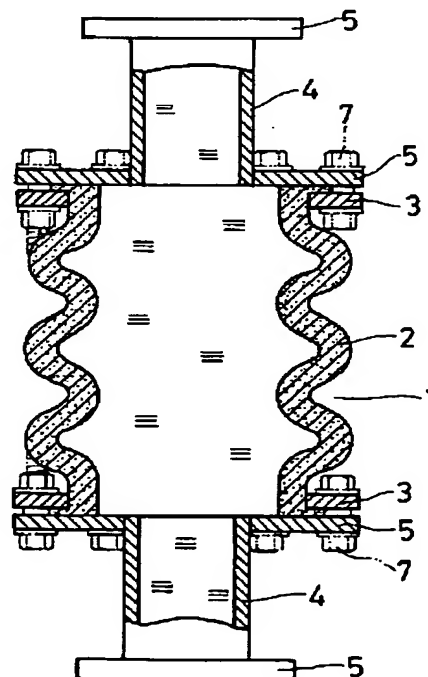
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(54) 【発明の名称】 水配管用消音方法及び水配管用消音器

(57) 【要約】

【課題】 ポンプ等の振動が接続した水配管に伝達しないようにするために設置する従来のゴム製フレキシブル管継手では、水中音の伝搬を効果的に低減することができず、これが原因となって、建物の居室への固体伝搬音を確実に低減することが困難である。

【解決手段】 そこで本発明では、ポンプ等の振動発生機器に連なる水配管6に、その配管の口径よりも大きな口径のフレキシブル管継手1を接続して、この管継手において管路を拡張する消音方法と、フレキシブル管継手の両側に短管4を接続して構成し、フレキシブル管継手の口径は短管の口径よりも大きく構成した水配管用消音器を提案する。



## 【特許請求の範囲】

【請求項 1】 ポンプ等の振動発生機器に連なる水配管に、その配管の口径よりも大きな口径のフレキシブル管継手を接続して、この管継手において管路を拡張することを特徴とする水配管用消音方法

【請求項 2】 フレキシブル管継手の両側に短管を接続して構成し、フレキシブル管継手の口径は短管の口径よりも大きく構成したことを特徴とする水配管用消音器

【請求項 3】 短管の端部に水配管との接続用フランジ又はねじを設けたことを特徴とする請求項 2 記載の水配管用消音器

【請求項 4】 フレキシブル管継手と短管とはフランジ接続により接続したことを特徴とする請求項 2 又は 3 記載の水配管用消音器

【請求項 5】 フレキシブル管継手と短管とはねじ接続により接続したことを特徴とする請求項 2 又は 3 記載の水配管用消音器

【請求項 6】 フレキシブル管継手と短管とは一体に構成したことを特徴とする請求項 2 又は 3 記載の水配管用消音器

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、ホテルや集合住宅等の建物において、ポンプ等の水供給用機器から発生する振動や音響が水配管を介して居室等に伝搬して放射されるのを低減するために適用する水配管用消音方法及び水配管用消音器に関するものである。

## 【0002】

【従来の技術】例えばホテル、集合住宅等の建物では、給水、給湯又は冷温水ポンプ等において発生する振動や音響が水配管を介して建物躯体に伝搬し、内装材等から居室内に固体伝搬音として放射することにより、音響上のクレームに繋がることが往々にしてある。この固体伝搬音は、例えばポンプの羽根の枚数に回転数を乗じた周波数、一般的には100～250Hzの周波数の範囲において顕著に現れる。

【0003】このような居室に影響を及ぼす管路系の固体伝搬音は、ポンプ等から伝搬した水配管の管路壁の振動が、管路の躯体貫通部及び管路の支持部から建物躯体に伝搬して生じるのであるが、ポンプ等から水配管には、管路壁を通して振動が伝達されることに加えて、管路内の水を通して音響が伝達されるため、上記躯体貫通部や支持部における水配管の管路壁の振動は、管路壁を通して伝わる振動と管路内水を通して伝わる音響の双方に影響される。従って居室への固体伝搬音を低減するためには、管壁を通して伝わる振動と、管路内水を通して伝わる音響の双方を低減する必要がある。

【0004】従来、ポンプ等の振動が接続した水配管に伝達しないようにするための方法としては、例えば図 4 に示すように、ゴム製のフレキシブル管継手 a を、主に

ポンプ b の吐出側及び吸込側に設置する方法が一般的である。このフレキシブル管継手 a は、図 5 に示すように接続する水配管 c の口径に合せて同径のものを設置している。かかる構成において、フレキシブル管継手の中には、軸方向、せん断方向共にばね定数が小さく、管路壁の振動の絶縁という意味では性能が良いものがある。また、固体伝搬音の低減対策を更に必要とする場合には、ポンプ等から水配管内の水に伝達する脈動を低減するために共鳴型や膨張型等の消音器を水配管の途中に設置する方法も取られている。

## 【0005】

【発明が解決しようとする課題】上述したように、ポンプ等から水配管には、管路壁を通して振動が伝達されることに加えて、管路内の水を通して音響が伝達されるため、従来のフレキシブル管継手では、管路壁の振動を絶縁したとしても、音響は余り減衰せずに水を通して透過してしまう。図 6 は従来のフレキシブル管継手による振動、水中音の低減効果（挿入損失）を測定した例を示すもので、この例では振動、水中音共に最大で10dB程度の低減効果しか得られない。

【0006】このため、フレキシブル管継手により管路壁の振動を絶縁したとしても、フレキシブル管継手を透過した音響の水中音圧により管壁が励振されて再び振動を発生して、これが上記固体伝搬音の原因となってしまう。このため従来のフレキシブル管継手のみでは固体伝搬音の十分な低減を行うことが困難であり、固体伝搬音の確実な低減のためには、上述したような消音器を別途設置しなければならず、構成要素の数が多くなってしまふ。本発明は、このような課題を解決することを目的とするものである。

## 【0007】

【課題を解決するための手段】上述した課題を解決するために本発明では、まず、ポンプ等の振動発生機器に連なる水配管に、その配管の口径よりも大きな口径のフレキシブル管継手を接続して、この管継手において管路を拡張する水配管用消音方法を提案する。

【0008】また本発明では、フレキシブル管継手の両側に短管を接続して構成し、フレキシブル管継手の口径は短管の口径よりも大きく構成した水配管用消音器を提案する。

【0009】本発明では、上記構成の水配管用消音器において、短管の端部に接続用フランジを設けて水配管と接続する構成とすることができるが、場合によってはねじ接続により水配管と接続する構成とすることもできる。

【0010】一方、本発明では、上記構成の水配管用消音器において、フレキシブル管継手と短管とはフランジ接続やねじ接続により接続する構成とする他、フレキシブル管継手と短管とを一体に構成することもできる。

【0011】以上の本発明によれば、フレキシブル管継

手は、従来と同様に管路壁を通しての振動を絶縁することができると共に、この部分において管路が拡張されるため音響挿入損失が大きくなり、フレキシブル管継手を越えての音響の伝搬を低減することができる。こうしてフレキシブル管継手のみで、管路壁を通した振動の伝達と管路内水を通しての音響、即ち水中音の双方を低減することができる。

#### 【0012】

【発明の実施の形態】次に本発明の実施の形態を図を参照して説明する。図1は本発明を適用した水配管用消音器の正面図であり、また図2は中央の縦断面図である。符号1はフレキシブル管継手であり、このフレキシブル管継手1はゴム製継手本体2の両端に接続用フランジ3を設けた構成である。また符号4は両端に接続用フランジ5を設けた短管で、この短管4は、接続用フランジ3、5のフランジ接続によりフレキシブル管継手1の両端に接続している。図2に明示しているように、フレキシブル管継手1のゴム製継手本体2の口径は短管4の口径よりも大きくしている。一方、短管4の口径は、水配管6の口径やポンプ等の吐出口及び吸込口の口径に同じで同径等適宜に設定することができる。尚、フレキシブル管継手1と短管4との接続は、以上のフランジ接続に代えて、ねじ接続を適用することができ、また溶接等により一体に構成することもできる。またフレキシブル管継手1は既製のものを利用することができる。符号7は接続用ボルトである。

【0013】以上の構成において、本発明の水配管用消音器は、図4に示す従来のゴム製フレキシブル管継手と同様にポンプの吐出側及び吸込側に設置する。

【0014】この構成において、ポンプから短管4を通してフレキシブル管継手1の一端側に伝わった振動は、ゴム製継手本体2の壁を通して伝搬する際、大きく減衰して他端側への伝搬量が低減される。またポンプから短管4内の水に伝わった音響、例えばポンプの羽根の運動に起因する音響は、短管4内からフレキシブル管継手1の一端側のゴム製継手本体2内に至ると、管路の径が急に大きくなって音響インピーダンスが大きく変化するた

め音響減衰が生じ、他端側への伝搬量が低減される。

【0015】図3は図6と同様な測定を本発明による消音器について行った結果を示すもので、この測定例においては、音響上のクレームに繋がる100～250Hzの周波数範囲において、管路壁を伝わる振動及び管路内水を伝わる水中音共に、20dB以上の低減効果が得られ、双方に対して十分な低減性能を示すことがわかる。

#### 【0016】

【発明の効果】本発明の消音方法及び消音器は以上のとおりであるので、次のような効果がある。

a. フレキシブル管継手において、管路壁を通した振動の伝達と、管路内水を通しての音響の双方を低減することができ、居室内への固体伝搬音を効果的に低減することができる。

b. 複数の要素を設置する必要がないので、スペース的、コスト的に有利である。

#### 【図面の簡単な説明】

【図1】 本発明を適用した水配管用消音器の正面図である。

【図2】 図1の中央の縦断面図である。

【図3】 本発明を適用した水配管用消音器による振動、水中音の低減効果を示す測定例を示す説明図である。

【図4】 ポンプに発生する振動の伝達を防ぐための従来の方法を示す説明図である。

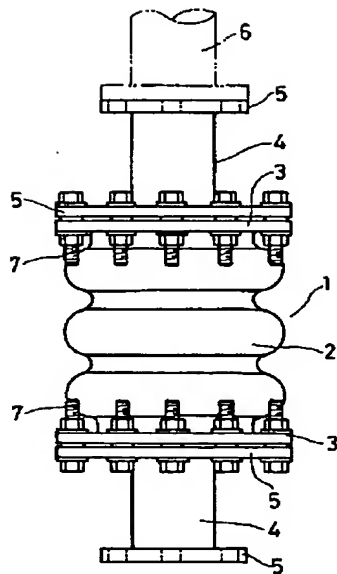
【図5】 ポンプに発生する振動の伝達を防ぐための主要な要素を示す説明図である。

【図6】 図6の要素による振動、水中音の低減効果を示す測定例を示す説明図である。

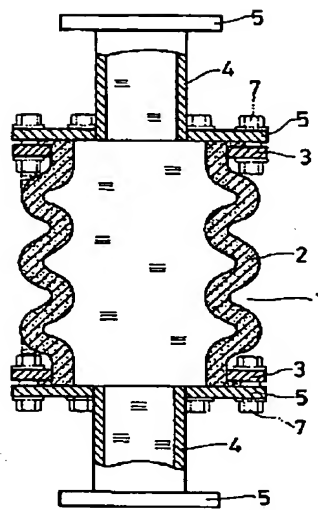
#### 【符号の説明】

1	フレキシブル管継手
2	ゴム製継手本体
3	接続用フランジ
4	短管
5	フランジ
6	水配管
7	接続用ボルト

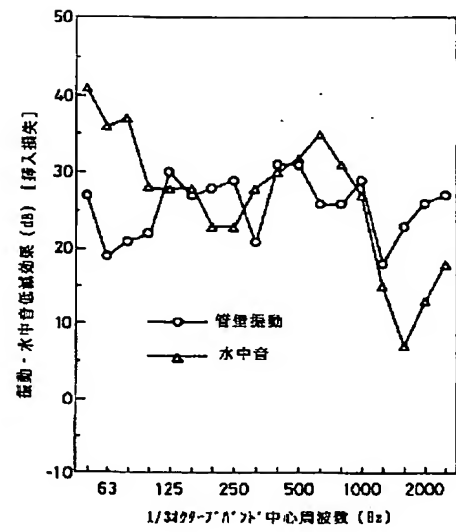
【図1】



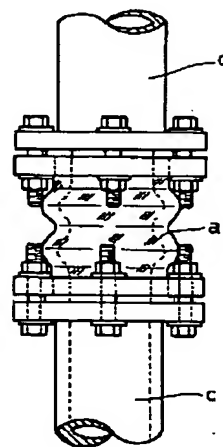
【図2】



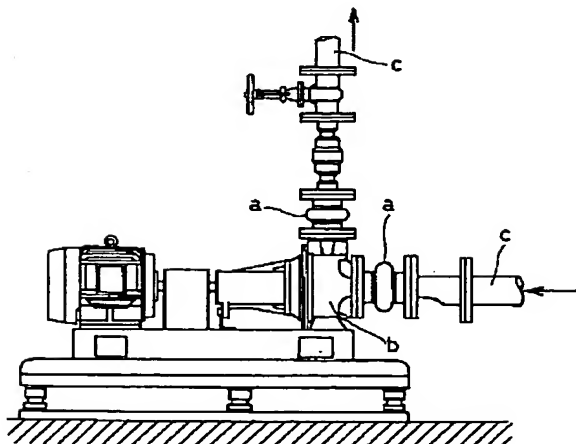
【図3】



【図5】



【図4】



【図6】

